



Nuclear power Engineering Strategy in Russia up to 2020

	2000	2010	2020	Growth, %
Electric energy generation, billion kW/h	878	1055	1240	141
Electric energy generation by NPPs	130	212	340 (290)	261 (223)
NPP power, GW	21,2	30	50 (40)	

- Construction of NPPs abroad
 - China
 - India
 - Iran
- Extension of nuclear fuel supplies



Up to 2020

- **Basis – LWR (VVER) reactors**
- **Building BN-800 fast breeder**
- **MOX fuel**
- **Closed fuel cycle**



Nuclear material (NM) security

- **Implementation of the state system of control of and accounting for nuclear materials. Plutonium register.**
- **Construction of spent fuel storage facilities (33000 tons by 2010)**
- **Industry program "Improvement of NM, nuclear facility physical protection...." For 2001 – 2007**
- **Role of the "closed cities" factor in proliferation risk reduction**



Export control system

- The "Export control" law
- Lists of products subjected to control
- Company internal control
- Industry export council
- Licensing of "sensitive" export
- Industry expert/analysis laboratories



Development and manufacturing of equipment for:

- **Physical protection**
- **NM detection**
- **NM control and accounting**
- **Remote monitoring for detection of unauthorized access to storage facilities and nuclear facilities (and NM management)**



Improvement of laws and regulatory documentation

- The law "On the use of atomic energy" (nuclear facilities and materials are the state property)
- Permission to return spent fuel to Russia (Iran, etc.)
- Leasing of fuel and reactors including "on-barge designed" NPPs



Study of possible reduction of proliferation risk in reactor new designs and nuclear fuel cycle

- **Fast breeders – gradually give up to enrich uranium and extract pure plutonium**
- **Combination of fuel reprocessing and fabrication reactors ("dirty" fuel – radiation barrier)**
- **Deep burn-up reactors**
- **Transition to the uranium-thorium cycle**
- **Gas fluoride, pyroelectrochemical methods of fuel reprocessing**



Activities in the defense area

- **Modern storage facilities for storing NW and NM**
- **Physical protection**
- **Control and accounting**
- **Termination of production of highly enriched uranium and plutonium**



Extension of international collaboration

Agreements with the USA and other countries:

- **Weapons graded uranium utilization (one third of 500 tons)**
- **Plutonium utilization (34 tons)**
- **Utilization of nuclear submarines**
- **Construction of FM long-term storage facility at "Mayak"**
- **Shut up of three plutonium production reactors**



XXI century – the century of nuclear activity globalization

- **Joining efforts :**
 - Energy demand
 - Reactor and nuclear fuel cycle safety
 - Non-proliferation
- **Joint development (INPRO, Generation IV)**
- **Development of common approaches and criteria**
- **International safeguards systems**
- **Possible new approaches: international storage facilities, fuel reprocessing and fabrication facilities**



Database on Illicit Traffick of Nuclear Materials and Other Radioactive Sources in Russian Federation (1992-2000)

Incident Date	Incident Location	Material Type	Object Trafficked
1992			
1992-05	Glazov	N	84,26 kg Natural Uranium*
1992-10	Podolsk	N	1538 g High Enriched Uranium (45%)*
1992-12	Sarov	N	10 kg Natural Uranium*
1992-04	Volgograd red	S	Caesium-137
1992-10	Leningrad red	S	Caesium-137
1992-11	Sverdlovsk red	N	4,7 kg Natural Uranium*
1993			
1993-03	Electrostal	N	10,6 kg Low Enriched Uranium (3,6%) *(fuel pellets)
1993-09	Sarov	N	9,1 kg Natural Uranium*
1993-05	Glasov	N	11 kg Natural Uranium*
1993-06	Electrostal	N	2,5 kg Natural Uranium*
1993-11	Moscow	N	3,5 kg Depleted Uranium*
1993	Roctov red	S	Caesium-137*
1993-09	Novgorod red	S	Caesium-137
1993-08	Murmansk red	S	Caesium-137
1993	Smolensk red	S	Caesium-137
1993-06	Orenburg red	S	Caesium-137*
1993-12	Kazan	S	Caesium-137
1993-10	Primorsk red	S	Caesium-137*
1993-05	Glasov	N	3 kg Depleted Uranium*



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Incident Date	Incident Location	Material Type	Object Trafficked
1994			
1994-01	Electrostal	N	3 kg Low Enriched Uranium (3,6%) *(fuel pellets)
1994-03	Electrostal	N	2,972 kg High Enriched Uranium Dioxide (90%)*
1994-03	Snezhinsk	N	5,5 kg Natural Uranium*
1994-03	Sarov	N	3,71 kg Natural Uranium*
1994-08	Sarov	N	8,94 kg Natural Uranium*
1994-04	Sochi	N	3 kg Natural Uranium*
1994-08	Kaliningrad	N	30 kg Natural Uranium* (protective container)
1994-10	Moscow	N	27 kg Natural Uranium*
1994-04	Leningrad red	S	Caesium-137*
1994-04	Yackutiya red	S	Caesium-137
1994-05	Leningrad red	S	Caesium-137
1994-06	Nighegorod red	S	Caesium-137*
1994-09	Nighegorod red	S	Caesium-137*
1994-11	Nighegorod red	S	Caesium-137*
1994-12	Orenburg red	S	Ir-192
1994-10	Mordoviya red	S	Caesium-137
1994-03	Krasnoyarsk red	S	Caesium-137
1994-02	Ekaterinburg	N	30 kg Depleted Uranium* (protective container)
1994-08	Vladimir red	S	Caesium-137*

* Note: material was seized



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Incident Date	Incident Location	Material Type	Object Trafficked
1995			
1995-05	Electrostal	N	11 kg Low Enriched Uranium (3,6%) *(fuel pellets)
1995-06	Electrostal	N	1,7 kg High Enriched Uranium Dioxide (20%)* (U3O8)
1995-01	S-Petersburg	N	1,5 kg Low Enriched Uranium (3,6%) *(fuel pellets)
1995-07	S-Petersburg	S	Caesium-137*
1995-07	Irkutsk red	S	Caesium-137
1995-09	Nighegorod red	N	2 kg Natural Uranium*
1995-02	Kaliningrad red	S	Sr-90 + Y-90
1995-10	Kaliningrad	S	Caesium-137*
1995-11	Tchelyabinsk red	S	Caesium-137*
1995-12	Novosibirsk	N	10 kg Low Enriched Uranium (2,4%) *(fuel pellets)
1995-12	Leningrad red	S	Caesium-137
1996			
1996-06	Tatarstan red	N	50 g Natural Uranium*
1998			
1998-05	Volgograd	S	Caesium-137 (200 R/h, 20 TBq)
1998-05	Republic of Tuva	S	Caesium-137 (70 mR/h)
1999			
1999-07	S-Petersburg - Murmansk	S	Californium-252 (75 MBq)
1999-12	Ozyorsk Tchelyabinsk red	S	Metal scrap with content radioactive substances
2000			
2000-04	Russian-China border near Zabaikalsk town	N, S	Radioactive substances (Th, Ra, K) – 240 g
2000-06	Borovichi Novgorod red	S	Caesium-137 (100 K bq)